11.4 – The Normal Distribution Activity Name: _____

Part 1 – Empirical Rule

Now we will explore how to calculate probabilities for the class based on the Empirical Rule.

1) Suppose that Test grades have a bell-shaped distribution with a mean of 82 and a standard deviation of 5.

a) Between which two values do the middle 68% of test grades fall between?

b) Between which two values do the middle 99.7% of test grades fall between?

c) Between which two values do the middle 95% of test grades fall between?

2) Based on the same distribution as (1), use the empirical rule to find the following percentages of test grades that are:

a) Between 77 and 87 **b)** Between 67 and 97 **c)** Between 72 and 92

d) Greater than 87 **e)** Less than 72

f) More than 97 **h)** Less than 67

f) Less than 87 **h)** More than 72

Part 2– Normal Distribution

1. The mean speed of vehicles along a stretch of highway is 56 mph with a standard deviation of 4 mph. You measure the speed of three cars traveling along this stretch of highway as 62 mph, 47 mph, and 56 mph.

   Find the z-score that corresponds to each speed. Which car has the most unusual speed?

2. A highly selective university will only admit students who place at least 2 standard deviations above the mean on the ACT, which has a mean score of 18 and a standard deviation of 6.

   What is the minimum score than an applicant must obtain to be admitted to the university? What percent of students do not get admitted into the university? What percent do get admitted?

3. On a statistics exam, the class mean was 63 and the standard deviation was 7. On a biology exam, the mean was 23 and the standard deviation was 3.9.

   For each of the following students, determine which exam they scored better on (relatively) and find the percentage of students that scored higher than the student for the better exam.

   a. Student A earned a 73 on the statistics exam and a 26 on the biology exam.

   b. Student B earned a 60 on the statistics exam and a 20 on the biology exam.

   c. Student C earned a 78 on the statistics exam and a 29 on the biology exam.

4. A manufacturer of bolts knows that the average bolt they produce has a length of 8 cm with a standard deviation of 0.1 cm. If a bolt is 7.82 cm or shorter or 8.21 cm or longer, it must be destroyed.

    a. What is the z-score for a bolt that is 7.82 cm? What is the z-score of a bolt that is 8.21 cm?

    b. What percentage of bolts must be destroyed because they are too short?

    c. What percentage of bolts must be destroyed because they are too long?

    d. What percentage of bolts do not get destroyed?

5. The heights of women in the United States are normally distributed with a mean of 63 inches and a standard deviation of 2.75 inches. If you randomly select a woman in the United States, find the following probability that:

    a. She will be taller than 64 in.

    b. She will be between 59 in and 63.5 in.

    c. She will be between 64.5 in and 68 in.

    d. She will be shorter than 61.5 in or taller than 68 in.